

**METHOD AND APPARATUS FOR ENHANCING THE BUSINESS AND
ENGINEERING COMMUNICATION BETWEEN A SUPPLIER AND A BUYER**

Background of the Invention

[001] The present application is directed to communication networks used to enhance the communication process between a buyer and suppliers. More particularly, it is a systems integration solution providing a complete set of tools allowing companies to directly communicate documents via an internet connection which expedites the generation of Requests For Quotes (RFQ) and replies to the RFQ's in order to optimize the bidding and supply process

[002] Commonly, existing on-line business systems which intend to improve business flow between a buyer and a supplier only address partial business needs. In particular, existing communication solutions focus on a particular aspect of the business relationship such as the engineering communication or business communication. However, this piecemeal approach to improving business transactions result in systems which do not provide all information necessary for an efficient streamlining of the business process, and may also result in conflicting or overlapping systems being deployed within an organization. Such non-comprehensive solutions result in conflicts, miscommunication, or no communication between the business and engineering areas. Therefore, it has been determined to be beneficial to create an integrated internet based solution, which allows a buyer and its suppliers to exchange both engineering and business information in an organized, prompt, efficient, easy to use system.

[003] It was also deemed desirable by the inventors to create such a system having an open architecture, where all computers within a business network may have

access to information in a fast, efficient manner and to provide a secure transmission of information.

[004] Such a system should allow for the viewing, printing, and downloading of engineering files and other documents over an intranet or extranet to enhance communication related to parts design for rapid prototyping and development. The system security may include a protected firewall intranet web server and an extranet web server. It would also be desirable to permit the system to issue requests for quoting/bidding including cost estimations, for specific commodities and non-commodity products and services. Further, the system should provide for a parts forecast/purchase order system, and a strategic materials management system based on manager/vendor inventory concepts.

Summary of the Invention

[005] In accordance with one aspect of the present invention, data is exchanged between a buyer and a plurality of suppliers via an internet supplier on-line system. The process includes, generating by a buyer a request for a quotation from at least some of the plurality of suppliers for the cost of a part or device. A determination is made if the request for the quotation will include attachments. When the request for quotation will include attachments, documents are generated wherein the request for quotation and attachments include both engineering and business documents. The determination is made as to which of a plurality of suppliers are to be provided with the request for quotation and attachments. An inquiry is then made as to whether all suppliers which are to be provided with a request for quotation and attachments are registered on the supplier on-line system. If a desired supplier is not presently on the system, the supplier is registered and a notification to the buyer is automatically made upon the registration. Next a determination is made whether the request for the quotation is for a commodity part or device or it is for a non-commodity part or device. Thereafter, the buyer selects which suppliers are to receive the request for quotation pack, and the request for quotation pack is made available to the selected suppliers on the on-line system web

site. The selected suppliers are then e-mailed alerting them that the quotation package is available at the web site.

[006] Upon reviewing the web site, the supplier is able to download the request for quotation pack including the engineering and business information. Once the supplier has downloaded this information, and the e-mail is automatically generated to alert the buyer that such actions have occurred following an analysis of the request for quotation pack, the supplier is able to enter a quotation or bid by uploading information including additional documentation to the buyer via the web site.

Brief Description of the Drawings

[007] The invention may take form in various components and arrangements of components, and in various actions and arrangements of actions. The drawings are only for purposes of illustrating a preferred embodiment and are not to be construed as limiting the invention.

[008] FIGURE 1 depicts a topology for the supplier online (SOL) system according to the present invention;

[009] FIGURE 2 depicts actions in a process focusing on the supplier upon receiving a Request for Quotation (RFQ) pack in or from the SOL system such as found on an SOL portal web site;

[0010] FIGURE 3 illustrates the SOL arrangement of the present embodiment and the combination of business and engineering process data provided to a supplier;

[0011] FIGURES 4A-4E set forth a flowchart for an RFQ process.

[0012] FIGURE 5 is a document download process used in the supplier online system of the present invention;

[0013] FIGURE 6 depicts the flow process for an automatic document transfer process according to the present invention; and

[0014] FIGURE 7 details a document upload transfer process according to the present invention.

Detailed Description of the Preferred Embodiments

[0015] Turning to FIGURE 1, illustrated is a topology/architecture for a integrated web based software tool set, described here as a supplier online (SOL) system 10, designed for exchanging and managing supply chain information. FIGURE 1 illustrates that a centralized SOL information area 12 receives data from a variety of sources within an organization, providing a centralized area for the accumulation of engineering data. The engineering data may be received from ongoing design generation, from design teams 14, within the organization of the buyer. These design teams commonly generate engineering drawings such as 2D and 3D CAD drawings which are updated to SOL information area 12. Other engineering information may be received from stored engineering documents from archival databases 16. This archived data may be stored on a variety of systems and/or databases, including but not limited to a Virtual Print Room (XVP) system, which is a digital data base and printing system for engineering drawings, maps, and diagrams. An XVP system may include an engineering scanner, plotters and printers integrated for document generation. Virtual Print Room (XVP) is a product of Xerox Corporation. Virtual Print Room, XVP and Internet Docs are trademarks of Xerox Corporation.

[0016] Engineering information used by SOL information area 12, may also be obtained from an Internet Docs system, which is a scalable engineering document access solution of Xerox Corporation. Internet Docs 2.0, for example, permits a user to set the storage capacity of engineering documents and implements MS SQL technology to provide improved performance, and allows users easy access for viewing and printing of engineering documents within a network.

[0017] Additional engineering information is provided to SOL information area 12 from an intranet connection 18 which contains specifications and manufacturing standards applicable to the buyer's organization. The engineering information which exists at SOL information area 12 is accessible and shared with a Business Communication Center (BCC) 20.

[0018] BCC 20, which communicates with SOL information area 12, generates and issues Requests For Quotations (RFQ) along with additional business related

information such as impact analysis reports, quality reports, NPPO (Non Production Purchasing Operation) contracts, forecast delivery requirements, and other business related subject matter a supplier may need to respond to an RFQ. The engineering information for the RFQ and the business information will be combined into an RFQ Pack 22 having both business and engineering/technical information. RFQ Pack 22 is transmitted from BCC 20 to a back end SOL server 24 with appropriate synchronization and protocols allowing it to be transferred through SOL firewall 26 to a front end web server 28. A supplier 30, registered to the SOL system 10, and having an appropriate password accesses and downloads the RFQ Pack 22. The supplier may be connected to the SOL system 10 within an intranet/extranet connection or directly via the internet. Once the supplier has reviewed RFQ Pack 22, including the accompanying business and engineering data, the supplier electronically responds to the RFQ by submission of a bid or quotation.

[0019] The overall structure and operation of SOL system 10, permits cost reduction and process optimization in product, assembly, and parts development through the use of engineering drawing technologies as well as combining this data with business information and requirements. The SOL system 10 also provides conditions to deploy a structured process for responding to RFQs. While a single supplier is shown in FIGURE 1, it is to be understood that RFQ Pack 22 may be issued to multiple suppliers who then have an opportunity to enter the bidding process. Implementation of the SOL system, only requires a connection by the suppliers to the internet. While CAD/CAM systems may be used, they are not required. In this embodiment, as long as the supplier is capable of reading IGES, , DXF and STEP files their inclusion in SOL system 10 is possible. It is noted the configuration including back end SOL server 24, firewall 26, and web server 28, form the physical infrastructure 32 of the SOL system.

[0020] Turning to FIGURE 2, illustrated is an overview of the SOL system, focussing on actions related to the supplier. Particularly, as previously mentioned, a plurality of suppliers 34-40 may receive RFQ Packs. What is emphasized in this drawing is that when, for example, a supplier such as supplier A 40, having access to

the internet via an internet connection 42, will download the RFQ Pack to a work station 43 or other computing device. Supplier A 40 is then able to immediately download engineering information contained in the RFQ Pack to engineering workstations (CAD), plotters 44, CNC machines 46, or other devices. After reviewing this engineering information and following a review of the attached business information, the supplier will then submit its bid or reply to the RFQ. When the supplier wins the contract, for example to produce a part, the supplier may use the information from the RFQ Pack to begin immediate generation of parts 48 to be manufactured and supplied to the buyer 50.

[0021] Electronic transmission of engineering data, such as drawings, to the supplier on such an immediate basis decreases the lead-time necessary for generation of the actual physical parts to be delivered to the buyer 50. As previously noted, the electronic data received from the buyer in the form of engineering drawings etc. may be downloaded using background programs such as the Virtual Print Room (XVP), Intranet Docs 2.0, both from Xerox, or other document management systems.

[0022] Turning to FIGURE 3, depicted is a more detailed view of certain aspects of the SOL system 10. Emphasized in this figure is that the SOL system 10 provides the suppliers with both the engineering and business information necessary to reply to the issued RFQ and to assist in the manufacture of parts or devices which are to be delivered to the buyer.

[0023] Further, the buyer's environment is shown to include back end server 52, and an intranet firewall 54. From this environment, RFQ Pack 22 is issued to an SOL server 56 which provides a web site portal 57 to the SOL system. SOL server 56 makes an RFQ available to suppliers who are provided access to the RFQ Pack 22 through internet firewall 58. The supplier may communicate to the buyer through web site portal 57 to submit its reply to the issued RFQ Pack. The firewall architecture described in FIGURE 3, permits the viewing, printing, and downloading of engineering documents and other documents over the internet to intranet or extranet systems for approved registered suppliers. Thus, the security feature of the present embodiment

includes both a protected intranet server **52** (i.e. back end SOL server **52**) and a protected internet server SOL server **56**.

[0024] Turning to FIGURES 4A-4E, shown is a flow diagram representing one embodiment for an RFQ process as accomplished in the SOL system of the present invention. It is noted that actions occurring in the flowchart are placed within columns designated Buyer, Administration, BackSol/FrontSol Intranet Server, Supplier On Line Internet Server, and Supplier External Process. Actions within the flowchart are located under the appropriate heading during the process flow.

[0025] A start quotation process action **70** is undertaken by a buyer to generate an RFQ and a bidding process between multiple suppliers when it is determined by a buyer that a component, part, device or other item is needed by the buyer. A first inquiry made is whether a file attachment will be necessary for the RFQ **72**. When the answer is no, the process moves to action **74** where the buyer begins the process of generating and distributing the RFQ. On the other hand, when in action **72** when it is determined a file will be attached to the RFQ, then the process flow moves to action **76**. In action **76**, the buyer inputs the files which are to be attached to the RFQ. Particularly, files from the Xerox Virtual Print Room system, the Internet Docs system or other document storage system having engineering drawings etc. are downloaded by the buyer to a computer in the Business Communication Center (BCC) **20**. The engineering information may, for example, be obtained from or through the SOL information area **12** of FIGURE 1. Additionally, business information such as production forecast ,contracts, impact analysis studies, quality reports, etc. which are to be included, are also obtained and stored on the buyer's computer in the BCC. It is to be noted that action **76** may be accomplished prior to a buyer logging into the software portion of the SOL system **10**. This is true in this embodiment as the buyer may already have access to the databases containing the needed information. However, in other embodiments, SOL **10** can require the buyer to log on to the SOL system in order to obtain access to the documents. Returning to FIGURE 4A, at this point, the process moves to action **78** (it is to be noted that action **74** also moves action **78**). The

buyer is now directed to log into the software portion of the SOL system in order to generate an RFQ Pack and make the RFQ Pack available to suppliers.

[0026] Once the login process has been completed **78**, which may be accomplished by a number of known login techniques, the system moves to action **80** where an inquiry block questions whether all suppliers to be involved in the RFQ Pack bidding process are registered on the SOL system. If the answer to this inquiry is no, then a supplier is invited to register into the SOL system. This may occur via an e-mail message from the buyer, or simply a telephone conversation between the buyer and supplier. In this embodiment of action **80**, the buyer may determine that a particular supplier has not been registered in one of many ways. For example, the SOL system may include a supplier page listing all suppliers that are currently registered on the system. When a supplier does register, the process moves to action **84** where the SOL system issues an e-mail to the buyer informing the buyer that the supplier has registered.

[0027] If in action **80**, all suppliers are noted to have been registered, the process moves to action **86** of FIGURE 4B. The next inquiry made at action **86** is whether the RFQ will be for a commodity part or device. In other words, the system determines whether this is a commodity part or device such as found in an existing catalog, or it is a non-commodity part or device. When it is determined that the RFQ will be for a commodity part, the system moves to action **88** where the buyer builds the RFQ process by combining the business and technical information previously obtained into a single a package or pack. Again, this information is drawn from both the engineering and business databases available to the buyer within its organization.

[0028] The actions of generating the RFQ Pack include generating an electronic document which may have both engineering and business information. The document may be a standardized form implemented by the buyer's organization. Attachments may be accomplished in one of a variety of manners, including the implementation of hypertext links, wherein reference to engineering drawings within a written text lead a user to engineering or business documents. Alternatively, engineering drawing files

may be attached to the end of the electronic document and the supplier will download and open these files in any known manner.

[0029] Once the RFQ Pack has been generated, the process moves to action **90** where the buyer registers the RFQ Pack program information to be sent out for bidding. At this point the SOL system will generate a bidding number. Within this bidding operation created by the SOL system, the buyer, in action **92**, registers the particular part number or device number information for that bidding process. Once the part/device number information has been included within the bidding operation, the process moves to action **94** where the user will be prompted to select on a part/device number screen, a specific documentation to be attached or associated with a particular part/device number of the generated bid. Therefore, the business information that had been accumulated in action **88** may be more specifically associated with the particular parts/devices designated by parts/device numbers being put up in the bid process under the registered bidding number. The process then moves to action **96**, where the user is prompted to select, on a bidding screen, for each part/device, all the suppliers that are to receive the RFQ Pack. It is to be appreciated, that the part/device bidding screen may be viewed by the buyer on their computer or workstation in the BCC **20** of FIGURE 1. Also, while FIGURE 1 shows a single BCC section, of course multiple buyers may be attached to the present SOL system.

[0030] Returning to action **86**, if the buyer determines that the RFQ to be generated is not for a commodity part or device, the process moves to action **98** of FIGURE 4C. In this action, similar to action **88**, the buyer will build the RFQ process by bringing together business and technical information into a single package. Once this information from the various sources have been obtained, the process moves to action **100** where the buyer registers the program information in a service bidding process and the system generates a bidding number for that service bid. Once the bidding number has been obtained, the process moves to action **102** where the buyer selects, on a service bidding screen, the documentation that will be attached for each specific service bid. Thereafter the process moves to action **104** where the buyer selects on the service bidding screen, all suppliers that need to receive that particular RFQ. It

is to be understood that the service bidding screen may also be a screen shown on the computer or workstation in BCC 20 of FIGURE 1.

[0031] Turning to FIGURE 4D, once the process has generated an RFQ Pack for either a commodity part/device or a non-commodity part/device, the system moves to action 106 where the buyer discharges the bidding on the bidding screen. Particularly, the buyer requests that the generated RFQ Pack be forwarded to all selected registered suppliers.

[0032] At this point, the process moves to action 108 where the back end SOL server begins a synchronization operation so that data of the RFQ Pack is synchronized with data of internal and external data bases from which documentation within the RFQ Pack needs to be transferred. Such a synchronization may be executed, in one embodiment, by the use of an XML (Extendable Markup Language) process which is known in the art. Once synchronization has been achieved the files are transferred. Additionally, in action 108 the SOL system generates and sends an e-mail notification to the suppliers informing them of the existence of an RFQ Pack which now may be obtained

[0033] Following the operations in action 108, the process moves to action 110. Particularly, the suppliers involved in the bidding process will receive the previously mentioned e-mail notifications. These notifications will inform the suppliers, as shown in action 112, that they have an RFQ available on the SOL web site portal, which they may then review. In action 114 each supplier which has been supplied access to the RFQ Pack is able to download the engineering and business information which has been integrated in the RFQ Pack. In responding to the RFQ Pack, the suppliers will upload, as part of their response, their own documentation and/or business information to the buyer (action 116). By this operation a quotation is obtained by the buyer from the registered suppliers via the SOL system, action 118.

[0034] Following action 118, and as shown in FIGURE 4E, in action 120 once the supplier has generated a quotation response to the RFQ Pack, the back end SOL server generates an e-mail notification to the buyers. This notification will be received via an e-mail after a supplier has generated and submitted its quotation, action 122.

Additionally, the SOL system will analyze the "Close Day" for each RFQ to which a supplier is responding. This operation begins at action **124**. A Close Day, as noted at action **126**, is the day after which a supplier is no longer permitted to submit a quotation.

[0035] From action **124**, the process moves to inquiry action **128**, where the system will question whether there is a need to change the Close Day of the RFQ Pack.

If the response to this inquiry is in the positive, the process moves to action **130**, where an inquiry is made as to whether the Close Day is higher than the "Work Day." Particularly, action **130** inquires whether the Close Day (e.g. May 10) is before (e.g. May 5) or after (e.g. May 30) the Work Day; where the Work Day is the last day the buyer has determined is acceptable for receiving quotes in order to receive the part or device of the RFQ Pack by a desired date. If the Close Day is before the Work Day, the process moves to action **132** where the buyer is provided with an opportunity to alter the date of the Close Day. If the buyer alters the Close Day, the process moves to action **134** where the back end server generates e-mail notifications to all suppliers of this date change. At this point, the process re-traces actions **110-118** of FIGURE 4D.

[0036] Alternatively, if in action **130**, the Close Day is the same as the Work Day, the process moves to action **136** wherein it is determined that no additional quotations from suppliers are to be received and therefore the buyer may review the quotations from each supplier who has answered the RFQ Pack. At this point, the process moves to action **138** where the RFQ process is completed. The supplier may after this time make a selection to accept one of the supplied bids, or redo the RFQ process.

[0037] Turning to FIGURE 5, depicted is a flowchart describing the process to send a documentation direct to supplier. Initially, in action **140**, a buyer initiates the document download process. In action **142**, the buyer obtains and then compresses documents that are to be part of the RFQ Pack, such that the compressed documents are located on the buyer's computer.

[0038] Following compression of the documents, the process moves to action **144** where the buyer starts the process for generating the RFQ Pack in the Supplier On-

Line (SOL) system. More particularly, as described in action 146, the buyer selects the type of document (e.g. drawings, standards, specifications and others). The buyer then fills out a description of the documents and selects the previously compressed files. These files will eventually be provided to all suppliers to share when responding to the RFQ Pack. The SOL system then generates a document number for each of the described and compressed files which are to be included in the RFQ Pack.

[0039] Once the actions of action 146 have been completed, the back end SOL server will generate an e-mail notification for the selected suppliers, action 148. The e-mail is received by the selected suppliers 150, and thereafter the supplier is permitted to access and download those files which have been sent 152. The back end SOL server, action 154, will register the download date for each file downloaded by a supplier, and will send an e-mail to the buyer indicating that the information has been downloaded by the supplier, whereafter the process closes, action 156.

[0040] The flowchart of FIGURE 5 therefore depicts a more detailed view of the process by which documents, including engineering and/or business documents included within an RFQ Pack are generated and then downloaded for display to a supplier.

[0041] Turning to FIGURE 6, shown is a flowchart setting forth actions in an automatic document transfer process of the present invention. In action 160, a buyer initiates automatic document transfer process, wherein files which are to be transferred to each supplier are generated, action 162. This generation may occur by pulling the files from other databases where they have been archived. In a action 164, the automatic transfer process then transfers all files which are generated to a supplier folder located on the back end SOL server. Each registered supplier may have a separate file into which the generated documents or files are placed.

[0042] Once this transfer of files has been accomplished, the process moves to action 166 wherein the back end server begins a synchronization process such as an XML process, whereby synchronization of the data with internal and external databases is undertaken to permit the transfer of the files. This action also generates an e-mail notification to the suppliers where the suppliers receive the notification in action 168.

The notification indicates that the files are available. Thereafter, and as shown in action 170, the supplier is provided with the capability of accessing the SOL web site to download the files which have been forwarded. When the supplier downloads a file, the back end SOL server registers the download date and generates an e-mail for the buyer to indicate that the files have been downloaded, action 172. Thereafter, once the files have been downloaded and the buyers have been informed, the automatic document transfer process is ended, action 174.

[0043] Turning to FIGURE 7, provided is a flowchart which details a process for uploading document transfers. Particularly, this is a situation where the supplier accesses the SOL web site portal in order to upload information to the buyer. In action 180, the supplier begins the upload document transfer process whereby the supplier in action 182 compresses all the documents to be transferred to the buyer.

[0044] Once the selected documents have been compressed, the process moves to action 184 where the supplier accesses the SOL web site to upload the files to the supplier's organization. Particularly, the supplier will login, such as by entering a password, identifying the supplier as someone permitted to access the SOL web site. Once logged in, the supplier will instruct the SOL system 10 to upload the selected documents. This instruction causes the back end SOL server to begin a synchronization process (action 186) which may use for example an XML process, in order to synchronize the data with internal and external databases in order to transfer the files of the selected documents. Action 186 will result in the back end SOL server also generating an e-mail notification to the buyer that files are being uploaded. As the process moves to action 188, the back end SOL server registers the date each file from the supplier has been uploaded and sends an e-mail to a buyer. Next, the buyer is informed by the e-mail 190 of the upload. At the time of uploading, the supplier maintains the capability, action 192, of accessing the SOL system and downloading files from the buyer. Following this action, the upload document transfer process is closed, action 194.

[0045] The following description provides a complete set of tools which permit organizations to directly communicate documents over an intranet/extranet, which uses

a SOL portal web site. It further generates an internal workflow using e-mails which are automatically generated by the system to accelerate the process and to insure responsiveness between the parties.

[0046] The described SOL system therefore is a document management system/model based on an open infrastructure where all users of a network are able to access the information in a quick manner and to securely provide people with the information that is required in a buying/supplying transaction. Access can be restricted by use of login and password techniques. The system also connects customers and suppliers through the extranet.

[0047] By use of the SOL system described above, the following business operations are provided and improved, including the viewing, printing and downloading of engineering and other documents over an intranet or extranet. System security is provided by implementation of a firewall protected intranet web server and a firewall protected extranet server. This system also permits for the requests for quoting/bidding to include cost estimation process according to each specific commodity, the downloading of CAD/CAM files to enhance parts communication content process which in turn allows for rapid prototyping for development. The system still further provides a parts/forecast purchase order and a strategic materials management based on "vendor management inventory" concepts.

[0048] In one embodiment, the system is developed using MS ASP language and MS Visual studio (both products of Microsoft Corporation), and is served by an IIS 4.0 server. The system will access, in this embodiment, an Oracle database (from Oracle Corporation, and which is a trademark of Oracle Corporation), to store and retrieve data related to the workflow process it implements.

[0049] The back end SOL server includes a continuous updating feature to check for new bidding as it occurs or new RFQ Packs which are being put out to bid.

[0050] It is to be appreciated that the foregoing components and organization are simply one embodiment in which the present invention may occur. The invention has been described with reference to this preferred embodiment. However, obviously, modifications and alternations will occur to others upon reading and understanding the

preceding detailed description. It is intended that the invention be construed as including all such modifications and alterations insofar as they come within the scope of the appended claims or the equivalents thereof.